Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_ Per.: \_\_\_\_\_\_\_\_

**7.5 “Achording to Us…” Chord Investigations**

*Task Card*

**Directions:**

1. Do your own work on your own notebook paper.
2. Stick together and check-in about your questions and what you notice.
3. Make conjectures about chords and their…
   1. Central angles
   2. Arcs
   3. Distance to the center of the circle
   4. Perpendicular bisectors
4. Justify your reasoning.

**Justification Tips and Tool Box**

1. You can always add line segments or lines (radii!)
2. You can always re-label angles with other variables (e.g., *a* or *b*) or with numbers (e.g., 1, 2, or 3) to make it easier to explain.

* Congruent Triangles (SSS, SAS, ASA, AAS)
* CPCTC (show corresponding parts are congruent)
* Proportional Reasoning (recall the relationship between the central angle of a snowboarder’s orbit and how this angle corresponds to that arc’s degree measure)
* Isosceles Triangles (all radii are congruent within the same or congruent circles)

**Task 1:** Congruent Chords and Their Central Angles and Intercepted Arcs

1. Each member of your group should construct a circle with center *O*.
   1. Construct two congruent chords. Call them  and .
   2. Construct radii , , , and .
2. Use a protractor to find and . How do they compare?
3. Compare your findings with every member of your group. Write a conjecture that represents what your group noticed. Justify your reasoning completely.

“If two chords in a circle are congruent, then they determine two central angles that are \_\_\_\_\_\_\_\_. **We know this because…**”

1. Fold your circle to compare arc BA and arc DC. What do you notice about the intercepted arcs?
2. Compare your findings with every member of your group. Write a conjecture that represents what your group noticed. Justify your reasoning completely.

“If two chords in a circle are congruent, then their intercepted arcs are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. **We know this because…**”

Check-in with the Teacher: \_\_\_\_\_\_

**Task 2:** Congruent Chords and Their Distance to the Center of the Circle

1. Each member of your group should construct a different-sized, large circle and mark the center.
2. Construct two nonparallel congruent chords.
3. Construct the perpendiculars from the center to each chord.
4. How does the perpendicular from the center of a chord divide each chord?
   1. Use your compass to compare the lengths of the segments formed by the endpoints of each chord to the point at which the perpendiculars intersect the chords.
5. Compare your findings with every member of your group. Write a conjecture that represents what your group noticed. Justify your reasoning completely.

“The perpendicular from the center of a circle to a chord is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the chord. **We know this because…**”

1. Use your compass to compare the distances along the perpendicular from the center to the chords.
2. Compare your findings with every member of your group. Write a conjecture that represents what your group noticed. Justify your reasoning completely.

“Two congruent chords in a circle are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from the center of a circle. **We know this because…**”

Check-in with the Teacher: \_\_\_\_\_\_

**Task 3: Perpendicular Bisector of a Chord**

1. Each member of your group should construct a different-sized, large circle and mark the center.
2. Construct two nonparallel chords that are not diameters.
3. Construct the perpendicular bisector of each chord and extend the bisectors until they intersect.
4. What do you notice about the point at which the perpendicular bisectors intersect?
5. Compare your findings with every member of your group. Write a conjecture that represents what your group noticed. Justify your reasoning completely.

“The perpendicular bisector of a chord passes through the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a circle. **We know this because…**”

Check-in with the Teacher: \_\_\_\_\_

|  |  |  |
| --- | --- | --- |
|  | **After doing this** | **Your work should look like this** |
|  | Start with a line and point R which is not on that line. |  |
| Step 1 | Place the compasses on the given external point R. |  |
| Step 2 | Set the compasses' width to a approximately 50% more than the distance to the line. The exact width does not matter. |  |
| Step 3 | Draw an arc across the line on each side of R, making sure not to adjust the compasses' width in between. Label these points P and Q |  |
| Step 4 | At this point, you can adjust the compasses' width. Recommended: leave it as is.  From each point P,Q, draw an arc below the line so that the arcs cross. |  |
| Step 5 | Place a straightedge between R and the point where the arcs intersect. Draw the perpendicular line from R to the line, or beyond if you wish. |  |
| Step 6 | Done. This line is perpendicular to the first line and passes through the point R. It also bisects the segment PQ (divides it into two equal parts) |  |

**Construct a Perpendicular Bisector**

|  |  |  |
| --- | --- | --- |
|  | **After doing this** | **Your work should look like this** |
|  | Start with a line segment PQ. |  |
| 1 | Place the compasses on one end of the line segment. |  |
| 2 | Set the compasses' width to approximately two thirds the line length. The actual width does not matter. |  |
| 3 | Without changing the compasses' width, draw an arc above and below the line. |  |
| 4 | Again without changing the compasses' width, place the compasses' point on the other end of the line. Draw an arc above and below the line so that the arcs cross the first two. |  |
| 5 | Using a straightedge, draw a line between the points where the arcs intersect. |  |
| 6 | Done. This line is perpendicular to the first line and bisects it (cuts it at the exact midpoint of the line). |  |